Electronic Services - Los Angeles
M102283X

Bailey

SECTION
E12-78

PRODUCT INSTRUCTIONS

TEMPERATURE RECEIVERS CLASS EF AND EG

INDEX

	Page
Explanation of Nomenclature	2
Installation	3
Description	5
Adjustment and Calibration	6
Maintenance	9
Replacement Parts	9

The Class EF and EG Temperature Receivers are used in the Type WM5□ Recorder or Indicator for the measurement of temperature by means of a d-c potentiometer circuit. Thermocouple voltage is converted to the rotation of a cam, which positions a drive lever that may be used to operate recording, integrating, and control devices in the Recorder or Indicator.

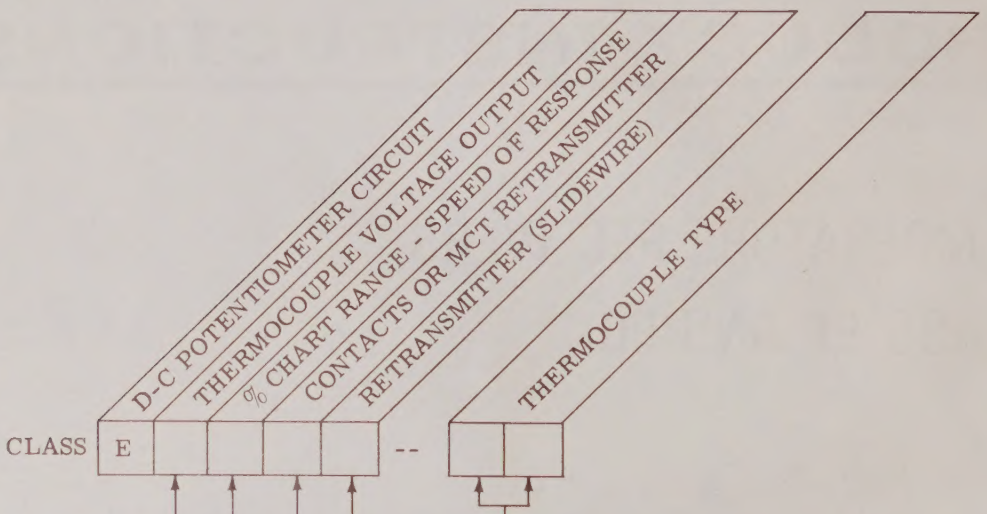
CROSS REFERENCES

Instrument or Equipment	Instruction Section
Type KM5□ or WM5□ Recorder or Indicator	E12-3
Electric Receiver for Type WM5□ Recorder or Indicator (Assembly and Components)	E12-42
Solid-State D-C Amplifier Pt. No. 6618750-□	E12-46

BAILEY METER COMPANY • WICKLIFFE, OHIO 44092

FORM IE12-78-967
LITHO IN U.S.A.

EXPLANATION OF NOMENCLATURE



	Range Span	
	Minimum	Maximum
F	2 mv d-c	25 mv d-c
G	25 mv d-c	100 mv d-c

Single Temp.	Temp. Diff.	Thermocouples
B 1	F 1	Chromel-Alumel
B 2	F 2	Iron-Constantan
B 3	F 3	Copper-Constantan
B 4	F 4	Chromel-Constantan
B 5	F 5	Pt-Pt + 10% Rh
B 6	F 6	Pt-Pt + 13% Rh
B 7	F 7	Nickel-Nickel Moly
CO		Radiation Thermocouple (Engineering Data Required for desired Radiation Thermocouple)

**

	Speed Sec.	Recording Range
0	5	Non-Recording*
1	5	0-100% Chart Range
4	1	0-100% Chart Range

0	No Contacts or MCT Retransmitter
1	High or Low - Single Switch
2	High and Low - Two Switches
5	Single Output - 50% Null
6	Single Output - 0% Null
7	Double Output - 50% Null

0	None
1	100 Ohm Slidewire
2	2000 Ohm Slidewire
3	20 Ohm Slidewire
5	500 Ohm Center Tap Slidewire

*Non-Recording unit has ring scale on slidewire disc for calibration and readout.
**Pen speed across scale or chart.

An "X" in any Nomenclature position indicates that in this respect the feature is special. An "X" as a suffix to the Class indicates that the unit includes some special feature not covered by the Nomenclature.

© BAILEY METER COMPANY 1966

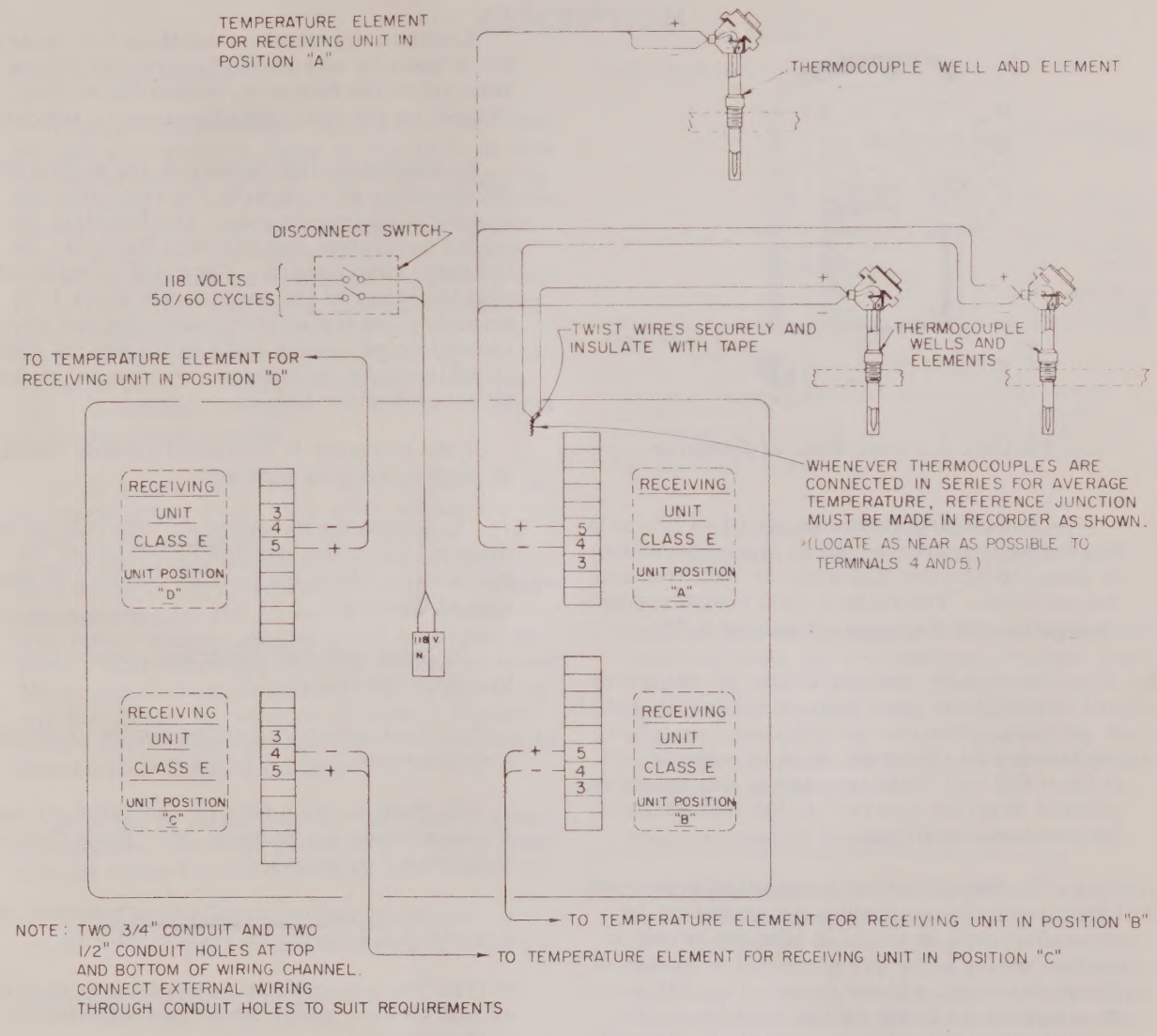

TEMPERATURE ELEMENT FOR RECEIVING UNIT IN POSITION "A"
THERMOCOUPLE WELL AND ELEMENT
DISCONNECT SWITCH
118 VOLTS 50/60 CYCLES
TWIST WIRES SECURELY AND INSULATE WITH TAPE
THERMOCOUPLE WELLS AND ELEMENTS
TO TEMPERATURE ELEMENT FOR RECEIVING UNIT IN POSITION "D"
WHENEVER THERMOCOUPLES ARE CONNECTED IN SERIES FOR AVERAGE TEMPERATURE, REFERENCE JUNCTION MUST BE MADE IN RECORDER AS SHOWN.
*(LOCATE AS NEAR AS POSSIBLE TO TERMINALS 4 AND 5.)
RECEIVING UNIT CLASS E UNIT POSITION "D"
RECEIVING UNIT CLASS E UNIT POSITION "A"
RECEIVING UNIT CLASS E UNIT POSITION "C"
RECEIVING UNIT CLASS E UNIT POSITION "B"
TO TEMPERATURE ELEMENT FOR RECEIVING UNIT IN POSITION "B"
TO TEMPERATURE ELEMENT FOR RECEIVING UNIT IN POSITION "C"
NOTE: TWO 3/4" CONDUIT AND TWO 1/2" CONDUIT HOLES AT TOP AND BOTTOM OF WIRING CHANNEL. CONNECT EXTERNAL WIRING THROUGH CONDUIT HOLES TO SUIT REQUIREMENTS

FIGURE 1 - External Connections, Class EF and EG Receivers

INSTALLATION

External Connections and Wiring

An external connection diagram for Class EF and EG Receivers is illustrated in Figure 1.

Power Requirements:

118 volts, 50 or 60 cycle power supply: 107 volts minimum, 127 volts maximum. ±2 cycles maximum variation in frequency. Power load: 13VA at .90 power factor, per Receiver.

Connecting Wire Requirements:

a. Number of Wires: Measuring circuit- 2 per Receiver. Power supply - 2 per Recorder or Indicator. Measuring circuit connecting wires must be of the same material as the thermocouple, and be continuous with no junctions of dissimilar metals. Series connected thermocouples must have all wires brought back to the Recorder or Indicator case and the reference junction made inside the case.

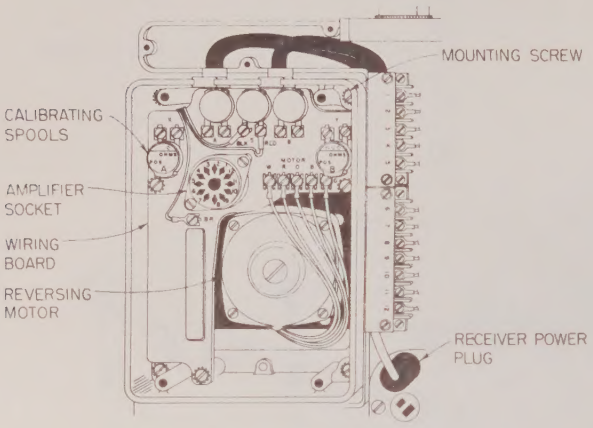


FIGURE 2 - Rear View of Receiver

b. Size and Maximum length of Wires in Measuring Circuit: No. 22 or larger depending on distance between Recorder or Indicator and thermocouple. The ratio of lead resistance to leakage resistance must not exceed 0.01.

c. For the measuring circuit use wires with low leakage, good dielectric insulation such as polyvinyl chloride, polyethylene, or teflon. Insulation wall thickness must be suitable for at least 600 volt rated operation. Use asbestos covered wire, or equivalent, for high ambient temperature conditions.

d. Shielding may be required to prevent interference from adjacent power wiring or other electrical devices. If adjacent power or control wiring is carrying current in excess of 25 amperes or a voltage greater than 240 volts, the measuring circuit wiring must be run in metallic shielded cable or conduit. If adjacent wiring is carrying current in excess of 35 amperes, shield must be of magnetic material and be grounded at one end.

e. Any number of similar measuring circuit wires may be combined in one close group, cable, or conduit.

Receiver

Figure 1 shows Class EF and EG Receivers mounted in the Type WM55 Recorder or WM53 Indicator in any of the four component positions. The unit, which includes the Receiver wiring board, solid-state d-c amplifier, and motor-driven slidewire unit, is secured to the rear of the Recorder or Indicator case by four mounting screws which are accessible when the amplifier cover is removed (Figure 2).

External electrical connections are made to the measuring and auxiliary terminal blocks adjacent to the Receiver, within the wiring channel on the rear of the Recorder or Indicator.

An adjustable link transmits the motion of the Receiver drive arm to the recording pen or indicating pointer yoke. The Receiver requires a different link for each Recorder or Indicator case position. Each link is stamped with the letter of the position for which it is suitable. The method for connecting and disconnecting adjustable links is illustrated under "Installation of Additional Components" in Instruction Section E12-3.

If the Receiver is furnished already installed in the Recorder or Indicator:

1. Install the Recorder or Indicator as outlined in Instruction Section E12-3 under "Installation". Place the pens or pointers in service at this time.

2. Make external electrical connections to the Receiver (Figure 1).

3. Test power source for correct voltage and frequency.

4. Turn on Recorder or Indicator. If the Receiver does not operate, see "Fault Correction Chart" on page 8.

5. Set amplifier sensitivity adjustment, as described in Instruction Section E12-46.

NOTE: The assembly has been factory calibrated and should require no further adjustment or calibration.

If the Receiver is being added to a Type WM5□ Recorder or Indicator, follow the instruction sheet that was shipped with the Receiver kit.

If the Receiver is being changed from one component position to another, use the adjustable link and pen or pointer assembly that are appropriate to the new position. If the pen or pointer assembly for the new component position is not already in service, install the correct pen or pointer assembly and start the pen as described in Instruction Section E12-3 under "Installation of Additional Components". Attach the adjustable link to the Receiver drive arm that is stamped with the appropriate Recorder or Indicator case position letter.

DESCRIPTION

Circuit Description

A simplified schematic diagram of the Class EF and EG circuit is shown in Figure 3. In this d-c potentiometer circuit, Receiver voltage e_2 (proportional to the rotation of the motor-driven measuring slidewire, SW) is balanced against input voltage e_1. Slidewire reference voltage E_r is obtained from a regulated d-c source within the Receiver. Current i_a flows continuously thru the calibration resistances and the slidewire contact determines the value of e_2. Since e_2 balances e_1, slidewire position is proportional to the input voltage, e_1, within the limits of the Receiver's range.

If, in a balanced circuit, e_1 changes and is no longer equal to e_2, then a d-c unbalance voltage, e_b, is applied to the Amplifier. The magnitude of this unbalance is proportional to the change in the measured variable; the polarity depends upon the direction of the change. The motor control section of the Amplifier applies a corrective signal to the reversing motor, M, to rotate the slidewire so that e_2 equals e_1 and the circuit is restored to balance (e_b becomes zero). The operation of the Amplifier is described in Instruction Section E12-46.

In order to obtain suitable filtering of stray a-c signals, the input is connected thru a filter circuit located in the Amplifier (see Figure 4).

A complete schematic wiring diagram of Class EF and EG circuits is shown in Figure 5.

Reference Junction Compensation

The reference junction is the point where the thermocouple extension leads are connected to the copper conductors of the Receiver. This junction is at the terminal block for the Receiver, located in the central wiring channel on the rear of the Recorder or Indicator. Since the voltage developed by the thermocouple is a function of the temperature difference between the fused end of the couple and the reference junction, it is necessary to compensate for changes in reference junction temperature to permit accurate temperature recording. This is accomplished by the nickel spool, N, that is incorporated in the circuit at the reference junction. If, for example, the temperature of the reference junction (and the nickel spool) increases, the voltage developed by the thermocouple decreases; but there is an accompanying increase in the resistance of the N spool, and thus an increased voltage drop across the spool (there is continuous current flow from the d-c reference voltage source thru X, N, and Y spools). This increase in voltage drop compensates for the decrease in thermocouple voltage, so that the measuring circuit remains balanced and the Recorder or Indicator reading remains correct.

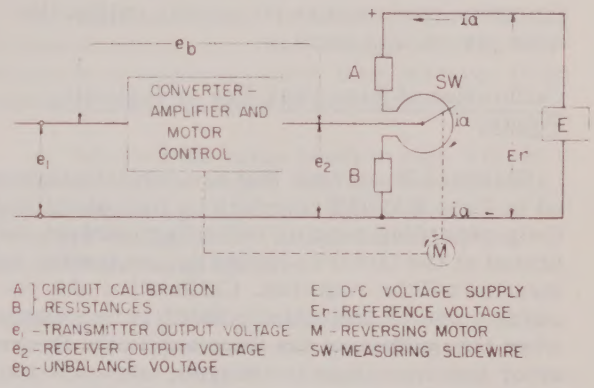


FIGURE 3 - Simplified Schematic Diagram of Class EF and EG Circuits

Measurement of Average Temperature

Thermocouples can be connected in series to provide an average temperature record. This arrangement is shown in Figure 1. Note that all series connections are made at the Recorder or Indicator terminal block so that cold junction temperatures will be the same as that of the compensator.

Contacts and Retransmitters

One or two electrical contacts may be furnished with the Class EF and EG Temperature Receiver for alarms, controls, etc. In addition, retransmitters (slidewire or MCT type) may be installed in the Receiver. These are described in Instruction Section E12-42.

Thermocouple Burnout Protection

Thermocouple burnout protection is provided by the Solid-State D-C Amplifier (see Instruction Section E12-46). In the event of thermocouple failure the pen or pointer is moved to 0% or 100% scale depending on the setting of the link switch in the amplifier.

ADJUSTMENT AND CALIBRATION

Class EF and EG Telemeter Receivers are furnished precalibrated by the Bailey Meter Company, and require no special calibration when placed into service.

Calibration of Recording Pen or Indicating Pointer

Standard Receivers that are furnished mounted in Type WM5□ Recorders or Indicators had their recording pens or indicating pointers calibrated at the factory. Normally, no further calibration will be required. Calibration of a recording pen or indicating pointer is necessary when the position of the Receiver in the Recorder or Indicator Case is changed, when a Receiver is added to a previously furnished Recorder or Indicator, or when thermocouple burnout protection is added or removed. The recommended procedure is outlined in Instruction

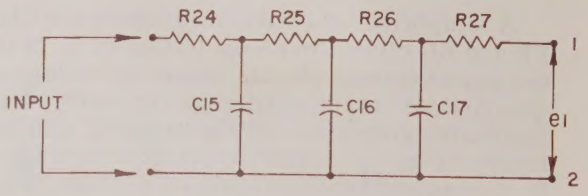
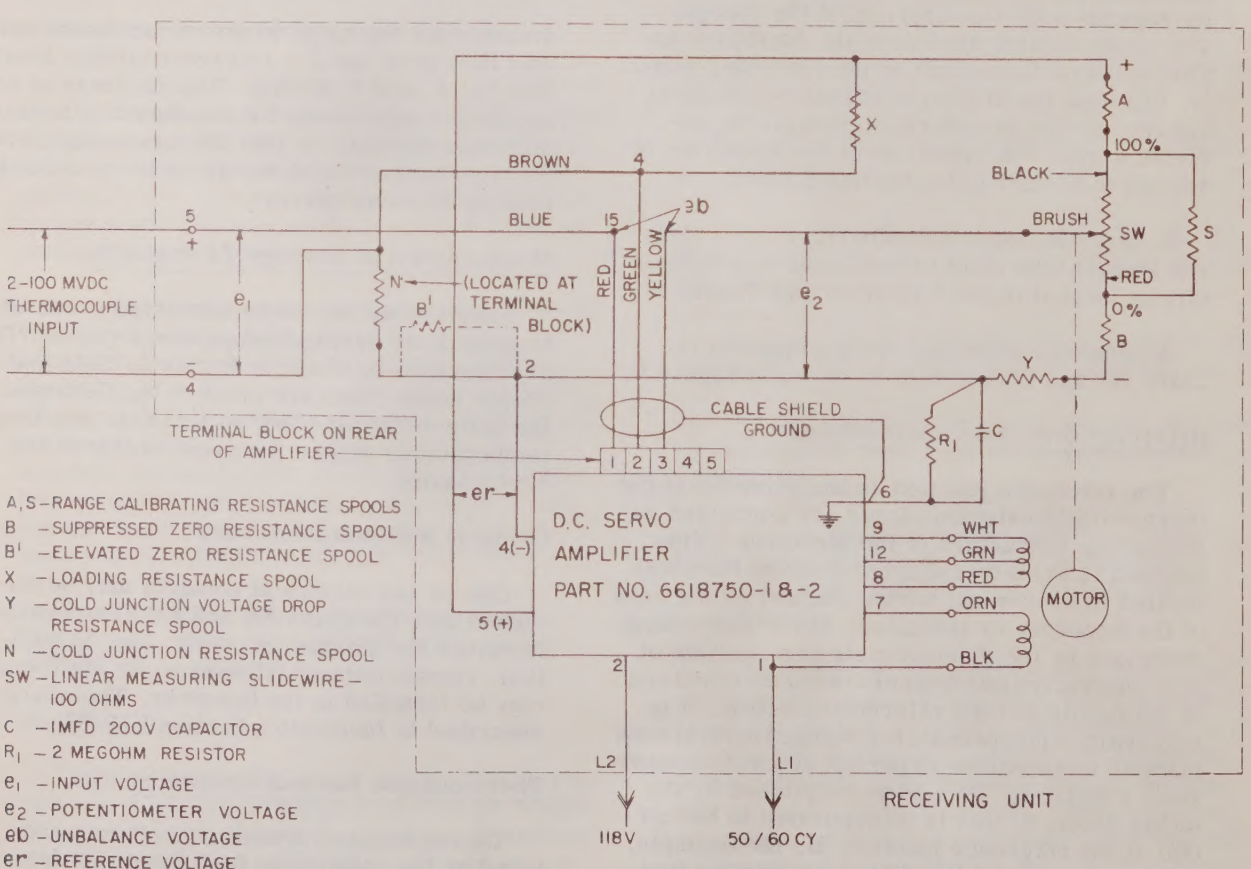


FIGURE 4 - Filter Circuit

Section E12-42, under "Adjustment and Calibration". (Omit steps 3 and 4.)

Reference Voltage Adjustment and Sensitivity Adjustment

These adjustments are made at the rear of the Amplifier, with the amplifier cover removed.



CLASS	AMPLIFIER PART NO.
EF	6618750-1
EG	6618750-2

FIGURE 5 - Schematic Diagram of Class EF and EG Receivers

They are described in Instruction Section E12-46 under "Adjustments". For Maximum accuracy in low range Receivers, allow a 30 minute warm-up period before making adjustments.

Checking Receiver Calibration

To check Receiver calibration, remove the thermocouple extension leads from the Receiver terminal block in the wiring channel on the rear of the Recorder or Indicator, and connect an accurate millivolt potentiometer to the terminals.

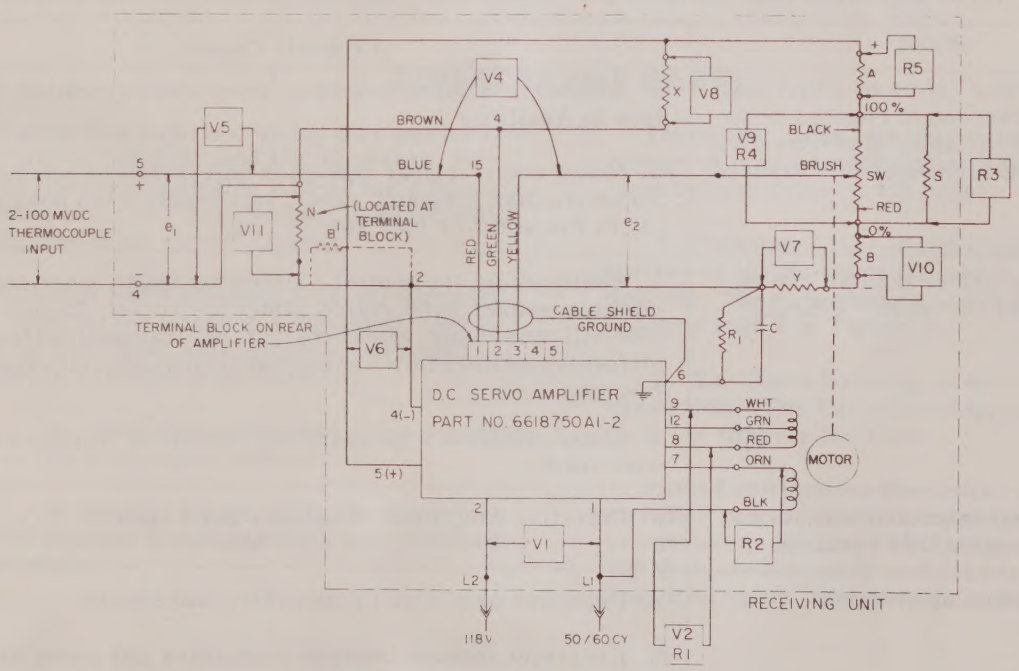
1. Determine the reference junction temperature at the Recorder or Indicator terminals by using an accurate glass-stem mercury thermometer.

2. Refer to Table II or III, pages 14 thru 16, to determine the millivolts developed by the reference junction at the temperature measured. (Interpolate to obtain intermediate values from the data.)

3. Also determine, from Table II or III, the millivolts which would be developed by the thermocouple at maximum chart temperature, if the reference junction were at zero degrees.

4. Subtract the value found in step 2 from the value found in step 3, and set the millivolt potentiometer equal to their difference. The Recorder or Indicator reading should be the temperature being checked.

NOTE: If a millivolt potentiometer with a built-in ambient temperature compensating dial is used, take care to avoid erroneous settings. Either:



A-C Voltage Measurements Made on Scale Having 1000 Ω/Volt Resistance or Greater
- V1 - 119V ±10V
- V2 - .5 to 5V A-C (At Balance) 10 to 20V A-C Running

Voltage Measurements Made with D-C Potentiometer
- V4 - 0 (At Balance)
- V5 - 0 to 100 MV (Input Voltage)
- V6 - 1.019V D-C

Voltage Measurements Made with D-C Potentiometer - Since Circuit Designed for 1 MA Current Flow each Branch Potential Drop Across Resistor Equals Resistance Value in Millivolts
- V7, V8, V10 - Value as Indicated on Resistors
- V9 - Equals Millivolt Range

Resistance Values
- R1 - 23 Ohms
- R2 - 850 Ohms
- R3, R5 - Range Spool - Remove from Recorder
- R4 - 100 Ohms when Disconnected

} Use Wheatstone Bridge for Measurement

FIGURE 6 - Voltage and Resistance Measurements for Class EF and EG Circuits

(a) use copper leads to connect the potentiometer to the Receiver, set the compensating dial at zero, and follow the above procedure; or

(b) use copper leads to connect the potentiometer to the Receiver, set the reference junction temperature (at the Receiver terminals) on the compensating dial, and set the potentiometer to the value found in step 3 above.

5. If the pen or pointer reading is incorrect, adjust the reference voltage (see Instruction Section E12-46) to make the reading accurate.

6. Check several other readings within the Receiver's range. If the Receiver is out of calibration, check for

a. Defective thermocouple,

b. Damaged or bent linkage, loose adjustment, etc..

c. Change in resistance of calibration spools or slidewire as a result of shorted turns or mechanical damage,

d. Improperly calibrated thermocouple burnout circuit.

FAULT CORRECTION CHART FOR CLASS E RECEIVER AND D-C POTENTIOMETER CIRCUIT

Fault	Probable Cause
1. Pen draws circle on chart and does not respond to changes in the measured variable, or pointer does not respond to changes in measured variable.	a. Amplifier failure. Amplifier input short circuited. Blown fuse in Amplifier. b. Motor rotor or gear reduction unit frozen or jammed. Slidewire disc assembly should turn freely when power supply to Recorder or Indicator is "off".
2. Erratic pen or pointer motion (not caused by rapidly changing variable).	a. Faulty slidewire contact. Slidewire brush must make positive contact over entire slidewire travel. Excess tension will cause wear. Slidewire must be clean and free from all foreign matter. Do not use any abrasive material when cleaning. b. Loose connection in measuring circuit or flexible slidewire leads.
3. Pen or pointer drifts and does not follow measured variable.	a. Defective Amplifier. Amplifier input open.
4. Insensitive or sluggish operation.	a. Defective Amplifier or Amplifier transistors. b. Excessive leakage between conductors and power circuits. Refer to external wiring recommendations. Resistance to ground should be in excess of 250,000 ohms. c. Low power supply voltage. Normal voltage should be within 107-127 volts a-c.
5. Recorder or Indicator not in calibration.	a. Damaged or bent linkage, loose adjustment etc. b. Change in resistance of calibration spools or slidewire as a result of shorted turns or mechanical damage. c. Range increase - open parallel resistor across slidewire.

MAINTENANCE

Information pertaining to the measuring circuit is given below. Maintenance instructions for the Recorder or Indicator, Amplifier and Electrical Receivers in general, may be found in the Instruction Sections listed under "Cross References".

Operation Checks and Fault Corrections

If the Temperature Receiver fails to operate correctly when first installed, perform the following checks in the sequence given:

1. Check power supply to the Recorder or Indicator (Figure 1)

Remove the wiring channel cover from the rear of the Recorder or Indicator, and use an a-c voltmeter to check the voltage across the Recorder or Indicator power supply terminals in the center of the wiring channel.

2. Check external connections.

3. If operation is erratic or if the motor oscillates rapidly about the balance point, the fault may be either excessive sensitivity or faulty connections in the external wiring at the Recorder or Indicator terminals or at the thermocouple.

If visual inspection and the above checks fail to reveal the source of trouble, or if the operation becomes faulty after the Receiver has been in service, refer to Figure 6. Refer also to the fault correction chart.

REPLACEMENT PARTS

Figure 7 is a parts drawing that applies specifically to Class EF and EG Receivers. Refer to Instruction Section E12-42 for a drawing showing parts that are common to Electrical Receivers of all circuit classes.

Although Parts Drawing E 12-107 normally will apply to the Receivers furnished, there may be individual differences in particular Receiver assemblies because of :

a. Design changes made since the printing of this Instruction Section.

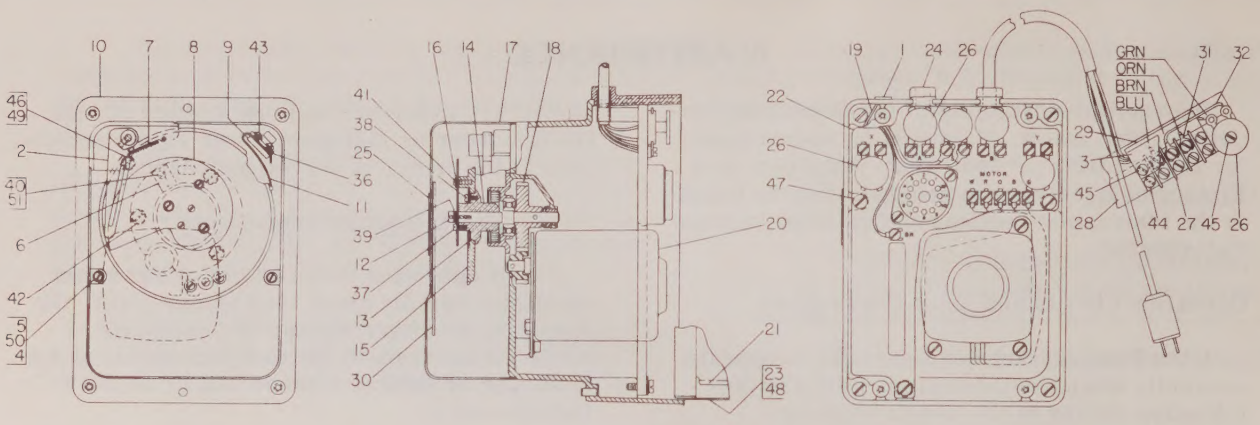
b. Special design of the Receiver furnished to make it suitable for a non-standard application.

Therefore, when ordering parts, assure the receipt of correct replacements for the equipment by specifying on the order:

1. Complete Class identification and code number of the Receiver for which the parts are desired. The code number is shown in a label which is Item 1 of Figure 7.

2. The Parts Drawing on which each part is illustrated. (The Parts Drawing number is given in the title for the Figure.)

Parts Drawings for Recorders or Indicators, including pen or pointer assemblies, are shown in Instruction Section E12-3, Type KM55 or WM55 Recorder and Type KM53 Indicator. For Amplifier parts, see Instruction Section E12-46.



ITEM	PART NO.	NAME
1	1961056-1	CODE LABEL
2	668059-1	CAM FOLLOWER SHAFT AND DRIVE ARM ASSY
3	667343-□	DESIGNATION PLATE- B1 REQD FOR "A" POS A2 REQD FOR "B" POS A3 REQD FOR "C" POS A4 REQD FOR "D" POS
4	6614001-1	COVER SCREW, 2 REQD
5	6614002-1	COVER SUPPORT STUD, 2 REQD
6	68839-2	CAPILLARY CLIP
7	661483-1	CAM ARM SPRING
8	666433-1	CAM
9	666321-1	BRUSH SUPPORT
10	666431-1	MTG BRACKET ASSY
11	667347-1	BRUSH ASSEMBLY
12	663016-1	SPRING KEY
13	661501-1	DISC CLAMP
14	666326-1	DISC HUB
15	661805-35	DISC ASSEMBLY
16	662153-1	DOWEL SLEEVE
17	666340-1	SLIDEWIRE COVER
18	666320-1	SHAFT GEAR AND BEARING ASSEMBLY
19	6612342-1	INSULATING PLATE
20	6618667-1	MOTOR ASSEMBLY
21	SEE TABLE	AMPLIFIER ASSY
22	SEE TABLE	WIRING ASSEMBLY
23	667206-1	AMPLIFIER COVER ASSY
24	35396-1	GROMMET
25	1961013-1	IDENTIFICATION PLATE, 2 REQD
26	666364-1	SPOOL, 6 REQD
27	1941529-3	TERMINAL BLOCK
28	35326-1	TERM. BLOCK SUPPORT
29	667341-1	FANNING STRIP
30	199287-1	LUBSAC AND TUBE ASSY (FOR HOLTZER-CABOT MOTOR)
31	1941520-1	TERMINAL SPADE
32	R2041-0400	BMCO NO. 140 LEADWIRE (2")
36	3-48x3/16	PAN HD SLOTTED STL SCR, 2 REQD
37	3-48x1/4	PAN HD SLOTTED STL SCR, 2 REQD
38	3-48x1/4	FILL HD MACH SCR, 2 REQD
39	3-48x3/16	HEADLESS CUP POINT SET SCREW
40	4-40x3/16	PAN HD SLOTTED STL SCR
41	4-40x5/16	RD HD THREAD CUTTING SCREW
42	6-32x1/4	PAN HD EXT SEMS, 3 REQD
43	6-32x5/16	PAN HD EXT SEMS, 2 REQD
44	6-32x1/2	RD HD THREAD CUTTING SCREW, 2 REQD
45	6-32x3/4	RD HD THREAD CUTTING SCREW, 3 REQD
46	8-32x1/2	PAN HD SLOTTED SCREW, 3 REQD
47	8-32x1/2	PAN HD EXT SEMS, 3 REQD
48	1/4-20x7/16	PAN HD SLOTTED SCR
49	NO. 8 SAE	LOCKWASHER, 3 REQD
50	NO. 10 SAE	LOCKWASHER, 2 REQD
51	1204	SHAKEPROOF LKWASH

TABLE		
CLASS	ITEM 21	ITEM 22
EF100 B1 to B7	6618750-1	6618803-1
EG100 B1 to B7	6618750-2	6618803-1
EF100 B1 to B7	6618750-1	6618804-1
EG100 B1 to B7	6618750-2	6618804-1

} SPECIAL, PER ENG. DATA

FIGURE 7 - Parts Drawing E12-107, Class EF and EG Receiver

TABLE I

THERMOCOUPLE		EXTENSION LEAD WIRE	
Plus	Minus	Plus	Minus
Chromel	Alumel	Chromel	Alumel (slightly magnetic)
Iron	Constantan	Iron (magnetic)	Constantan
Copper	Constantan	Copper	Constantan
Chromel	Constantan	Chromel	Constantan
Platinum +Rhodium	Platinum	Fine Strands, Cu-Ni Alloy	Coarse Strands, Copper
Nickel	Nickel + Molybdenum	Chromel	Alumel (slightly magnetic)

TABLE II

THERMOCOUPLE DATA -- MILLIVOLTS FOR FAHRENHEIT TEMPERATURES
(Based on ISA RP1.6 of August 1, 1954)

Reference Junction 0°F

°F	Chromel-Alumel	Iron-Constantan	Copper-Constantan	Chromel-Constantan	Platinum-Platinum + 10% Rh.	Platinum-Platinum + 13% Rh.
- 300	- 4.83	- 6.63	- 4.614	- 7.28		
- 250	- 4.28	- 5.82	- 4.077	- 6.42		
- 200	- 3.61	- 4.87	- 3.441	- 5.38		
- 150	- 2.84	- 3.79	- 2.713	- 4.21		
- 100	- 1.97	- 2.60	- 1.889	- 2.92		
- 50	- 1.02	- 1.33	- 0.984	- 1.52		
0	0.00	0.00	0.000	0.00		
50	1.08	1.39	1.059	1.61	0.156	0.154
100	2.20	2.83	2.187	3.29	0.321	0.319
150	3.34	4.30	3.381	5.06	0.501	0.499
200	4.50	5.80	4.637	6.89	0.695	0.695
250	5.65	7.31	5.950	8.78	0.900	0.906
300	6.77	8.83	7.317	10.73	1.117	1.129
350	7.88	0.37	8.734	12.73	1.342	1.360
400	8.99	11.92	10.195	14.77	1.574	1.603
450	10.11	13.46	11.700	16.86	1.812	1.853
500	11.25	15.01	13.245	18.97	2.056	2.111
550	12.39	16.54	14.827	21.11	2.305	2.376
600	13.54	18.07	16.443	23.27	2.558	2.646
650	14.70	19.61	18.091	25.46	2.816	2.922
700	15.86	21.15	19.770	27.67	3.077	3.202
750	17.03	22.68	21.475	29.88	3.340	3.486
800	18.21	24.21		32.11	3.606	3.776
850	19.38	25.74		34.34	3.875	4.069
900	20.57	27.29		36.59	4.146	4.363
950	21.75	28.84		38.84	4.419	4.662
1000	22.94	30.41		41.08	4.696	4.967
1050	24.12	32.01		43.33	4.974	5.275
1100	25.31	33.61		45.58	5.256	5.587
1150	26.49	35.25		47.83	5.540	5.904
1200	27.66	36.90		50.06	5.826	6.224
1250	28.83	38.60		52.29	6.115	6.545
1300	30.00	40.32		54.52	6.407	6.872
1350	31.17	42.08		56.73	6.701	7.202
1400	32.33	43.85		58.94	6.997	7.535
1450	33.48	45.64		61.13	7.269	7.873
1500	34.61	47.42		63.32	7.598	8.215
1550	35.75	49.20		65.49	7.903	8.559

Bailey

TABLE II (Continued)

THERMOCOUPLE DATA -- MILLIVOLTS FOR FAHRENHEIT TEMPERATURES
(Based on ISA RP1.6 of August 1, 1954)

Reference Junction 0°F

°F	Chromel-Alumel	Iron-Constantan	Copper-Constantan	Chromel-Constantan	Platinum-Platinum + 10% Rh.	Platinum-Platinum + 13% Rh.
1600	36.87	50.94		67.65	8.210	8.908
1650	37.99			69.78	8.520	9.260
1700	39.11			71.92	8.832	9.615
1750	40.21			74.04	9.148	9.973
1800	41.30			76.14	9.465	10.336
1850	42.38				9.786	10.702
1900	43.46				10.109	11.072
1950	44.53				10.434	11.447
2000	45.59				10.762	11.825
2050	46.64				11.092	12.204
2100	47.68				11.423	12.587
2150	48.71				11.755	12.970
2200	49.73				12.089	13.354
2250	50.74				12.422	13.740
2300	51.73				12.757	14.126
2350	52.71				13.091	14.511
2400	53.69				13.425	14.897
2450	54.65				13.758	15.283
2500	55.60				14.091	15.667
2550					14.424	16.053
2600					14.756	16.439
2650					15.088	16.824
2700					15.419	17.209
2750					15.749	17.592
2800					16.079	17.974
2850					16.408	18.354
2900					16.737	18.735
2950					17.065	19.115
3000					17.392	19.493
3050					17.718	19.872
3100					18.043	20.249
3150					18.367	
3200					18.690	

TABLE III

THERMOCOUPLE DATA -- MILLIVOLTS FOR CENTIGRADE TEMPERATURES
(Based on ISA RP1.6 of August 1, 1954)

Reference Junction 0°C

°C	Chromel-Alumel	Iron-Constantan	Copper-Constantan	Chromel-Constantan	Platinum-Platinum + 10% Rh.	Platinum-Platinum + 13% Rh.
- 200	- 5.75			- 8.71		
- 150	- 4.81	- 6.50	- 4.603	- 7.20		
- 100	- 3.49	- 4.63	- 3.349	- 5.18		
- 50	- 1.86	- 2.43	- 1.804	- 2.77		
0	0.00	0.00	0.000	0.00	0.000	0.000
50	2.02	2.58	2.035	3.04	0.299	0.298
100	4.10	5.27	4.277	6.32	0.643	0.645
150	6.13	8.00	6.703	9.79	1.025	1.039
200	8.13	10.78	9.288	13.42	1.436	1.465
250	10.16	13.56	12.015	17.18	1.868	1.918
300	12.21	16.33	14.864	21.04	2.316	2.395
350	14.29	19.09	17.821	24.97	2.778	2.890
400	16.40	21.85	20.874	28.95	3.251	3.399
450	18.51	24.61		32.96	3.732	3.923
500	20.65	27.39		37.01	4.221	4.455
550	22.78	30.22		41.05	4.718	5.004
600	24.91	33.11		45.10	5.224	5.563
650	27.03	36.08		49.13	5.738	6.137
700	29.14	39.15		53.14	6.260	6.720
750	31.23	42.32		57.12	6.790	7.315
800	33.30	45.53		61.08	7.329	7.924
850	35.34	48.73		64.99	7.876	8.544
900	37.36			68.85	8.432	9.175
950	39.35			72.68	8.997	9.816
1000	41.31			76.45	9.570	10.471
1050	43.25				10.152	11.138
1100	45.16				10.741	11.817
1150	47.04				11.336	12.503
1200	48.89				11.935	13.193
1250	50.69				12.536	13.888
1300	52.46				13.138	14.582
1350	54.20				13.738	15.276
1400					14.337	15.969
1450					14.935	16.663
1500					15.530	17.355
1550					16.124	18.043
1600					16.716	18.727
1650					17.305	19.409
1700					17.891	20.090
1750					18.474	

BAILEY METER COMPANY DISTRICT OFFICES, U.S.A.

CALIFORNIA

San Francisco
Code 415 Phone 989-6140

Los Angeles
Code 213 Phone 283-1187

COLORADO

Denver
Code 303 Phone 757-5408

GEORGIA

Atlanta
Code 404 Phone 378-4348

ILLINOIS

Chicago
Code 312 Phone 427-7324

LOUISIANA

New Orleans
Code 504 Phone 488-0841

MASSACHUSETTS

Boston
Code 617 Phone 426-0465

MICHIGAN

Detroit
Code 313 Phone 357-0440

MINNESOTA

St. Paul
Code 612 Phone 645-7752

MISSOURI

Kansas City
Code 816 Phone 361-4902

St. Louis
Code 314 Phone 962-5532

NEW YORK

Buffalo
Code 716 Phone 839-3662

New York
Code 212 Phone 986-8770

Schenectady
Code 518 Phone 374-7991

NEW JERSEY

East Orange
Code 201 Phone 674-6830

NORTH CAROLINA

Charlotte
Code 704 Phone 334-9161

OHIO

Cincinnati
Code 513 Phone 281-0132

Cleveland
Code 216 Phone 851-8600

PENNSYLVANIA

Philadelphia
Code 215 Phone 664-3282

Pittsburgh
Code 412 Phone 921-6356

TEXAS

Dallas
Code 214 Phone 363-6295

Houston
Code 713 Phone 774-9605

WASHINGTON

Seattle
Code 206 Phone 324-9300

WISCONSIN

Milwaukee
Code 414 Phone 461-1310

BAILEY METER COMPANY LTD., CANADA

ALBERTA

Edmonton
Code 403 Phone 488-3436

BRITISH COLUMBIA

Vancouver
Code 604 Phone 731-3709

MANITOBA

Winnipeg
Code 204 Phone 943-1481

NOVA SCOTIA

Halifax
Code 902 Phone 455-0574

ONTARIO

Ottawa
Code 613 Phone 722-1373

Toronto
Code 416 Phone 444-8488

QUEBEC

Montreal
Code 514 Phone 489-3881

Bailey

Bailey Meter Company • Wickliffe, Ohio 44092

In Canada: Bailey Meter Company Limited, Montreal, Canada